New England Common Assessment Program

Released Items Support Materials 2009

Grade 7 Mathematics

NECAP 2009 RELEASED ITEMS
GRADE 7 MATH

N&O 6.1 **Demonstrates conceptual understanding of rational numbers with respect to** ratios (comparison of two whole numbers by division a/b, $a:b$, and $a \div b$, where $b \neq 0$); and rates (e.g., a out of b, 25%) using models, explanations, or other representations.

1 The Math League team consists of 18 students. Of these students, 6 are seventh graders and the rest are eighth graders. Which statement describes the Math League team?

A. There are 2 eighth graders for every seventh grader.

B. There are 3 eighth graders for every seventh grader.

C. There are 12 eighth graders for every seventh grader.

D. There are the same number of eighth graders and seventh graders.

N&O 6.3 **Demonstrates conceptual understanding of mathematical operations** by describing or illustrating the meaning of a power by representing the relationship between the base (whole number) and the exponent (whole number) (e.g.,3^3,4^3); and the effect on the magnitude of a whole number when multiplying or dividing it by a whole number, decimal, or fraction.

2 Which value of n makes this sentence true?

$$n^2 = n^3$$

A. 1

B. 2

C. 3

D. 4

N&O 6.4 **Accurately solves problems involving** single or multiple operations on fractions (proper, improper, and mixed), or decimals; and addition or subtraction of integers; percent of a whole; or problems involving greatest common factor or least common multiple. (IMPORTANT: *Applies the conventions of order of operations with and without parentheses*.)

3 Andrew spent $16 on gasoline last week. He will spend 25% more on gasoline this week than he did last week. How much will Andrew spend on gasoline this week?

A. $64

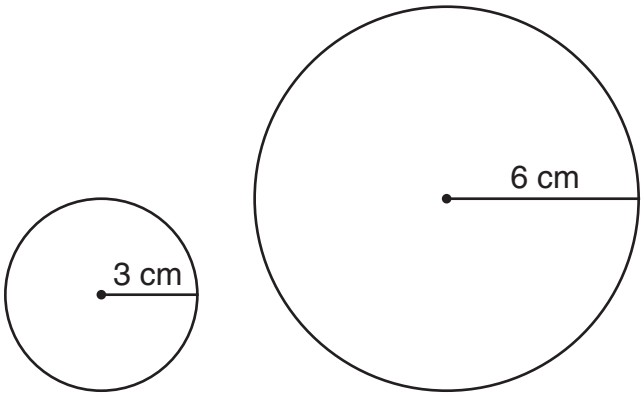
B. $41

C. $24

D. $20

G&M 6.5 **Demonstrates conceptual understanding of similarity** by describing the proportional effect on the linear dimensions of polygons or circles when scaling up or down while preserving the angles of polygons, or by solving related problems (including applying scales on maps). Describes effects using models or[sc] explanations.

4 Look at Circle R and Circle S.



How does the circumference of Circle S compare to the circumference of Circle R?

A. The circumference of Circle S is 2 times the circumference of Circle R.

B. The circumference of Circle S is 3 times the circumference of Circle R.

C. The circumference of Circle S is 4 times the circumference of Circle R.

D. The circumferences of Circles R and S are equal.

G&M 6.6 **Demonstrates conceptual understanding of perimeter** of polygons, **the area of** quadrilaterals or triangles, and **the volume of** rectangular prisms by using models, formulas, or by solving problems; and **demonstrates understanding of the relationships of circle measures** (radius to diameter and diameter to circumference) by solving related problems. Expresses all measures using appropriate units.

5 Drew is planting grass. The lawn is a rectangle that measures 120 feet by 75 feet. Drew uses 1 pound of grass seed for every 200 square feet of lawn. How much grass seed does Drew use?

A. 45 pounds

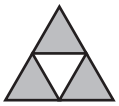
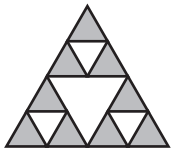
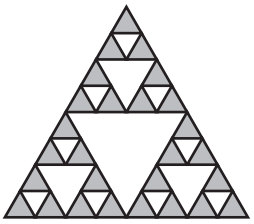
B. 90 pounds

C. 195 pounds

D. 390 pounds

F&A 6.1 **Identifies and extends to specific cases a variety of patterns** (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; or writes a rule in words or symbols for finding specific cases of a linear relationship; or writes a rule in words or[sc] symbols for finding specific cases of a nonlinear relationship; and writes an expression or[sc] equation using words or[sc] symbols to express the **generalization** of a linear relationship (e.g., twice the term number plus 1 or[sc] $2n + 1$).

6 Look at this pattern of shapes.

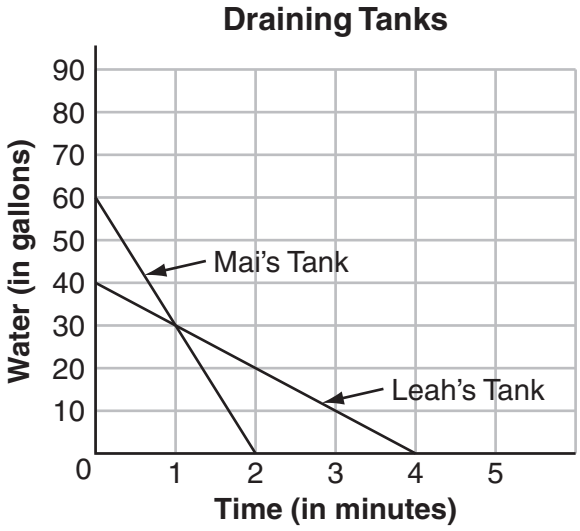
Figure		Number of Shaded Triangles
1		1
2		3
3		9
4		27

The pattern continues. How many shaded triangles will be in Figure 5?

A. 36
B. 81
C. 243
D. 729

F&A 6.2 **Demonstrates conceptual understanding of linear relationships** ($y = kx$; $y = mx + b$) **as a constant rate of change** by constructing or interpreting graphs of real occurrences and describing the slope of linear relationships (faster, slower, greater, or smaller) in a variety of problem situations; **and describes how change in the value of one variable relates to change in the value of a second variable** in problem situations with constant rates of change.

7 Look at this graph.



Mai and Leah drain two tanks of water. The graph shows the amount of water in each tank as it drains.

Which statement below is true?

A. Mai's tank always has more water in it than Leah's tank.

B. Leah's tank always has more water in it than Mai's tank.

C. Mai's tank drains faster than Leah's tank.

D. Leah's tank drains faster than Mai's tank.

F&A 6.3 **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write linear algebraic expressions involving two or more of the four operations; or by evaluating linear algebraic expressions (including those with more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when x=4 given y = 3x-2).

8 Which expression has the same value as $5 - 3x$, when $x = 4$?

A. $3x - 5$

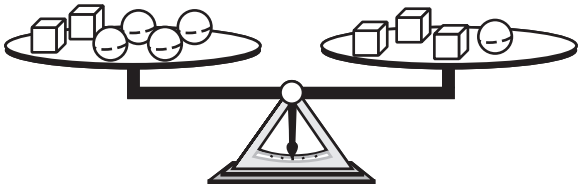
B. $2x - 15$

C. $2x - 16$

D. $x - 10$

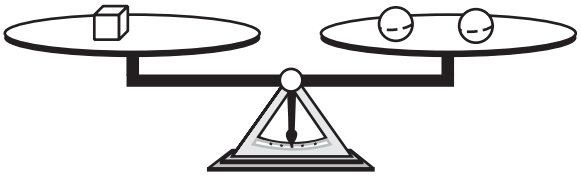
F&A 6.4 **Demonstrates conceptual understanding of equality** by showing equivalence between two expressions using models or different representations of the expressions (expressions consistent with the parameters of M(F&A)–6–3), solving multi-step linear equations of the form $ax \pm b = c$, where a, b, and c are whole numbers with $a \neq 0$.

9 The scale shown below is balanced.

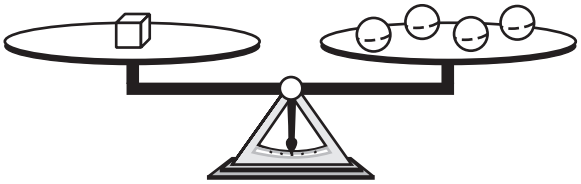


One scale below is correctly balanced. Which scale is correctly balanced?

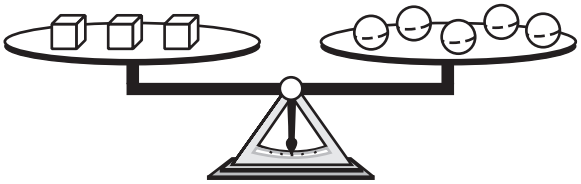
A.



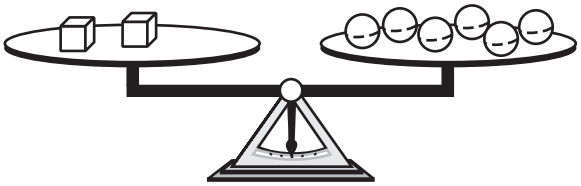
B.



C.



D.



DSP 6.1 **Interprets a given representation** (circle graphs, line graphs, or stem-and-leaf plots) to answer questions related to the data, to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems.

10 Michelle asked some students at a football game which team they were supporting. She displayed her results in this circle graph.

Michelle states that 90 students were supporting the home team. About how many students did she ask in all?

A. 120
B. 135
C. 150
D. 180

N&O 6.2 **Demonstrates understanding of the relative magnitude of numbers** by ordering or comparing numbers with whole number bases and whole number exponents (e.g.,3^3, 4^3), integers, or rational numbers within and across number formats (fractions, decimals, or whole number percents from 1- 100) using number lines or equality and inequality symbols.

11 This list of numbers is in order from least to greatest.

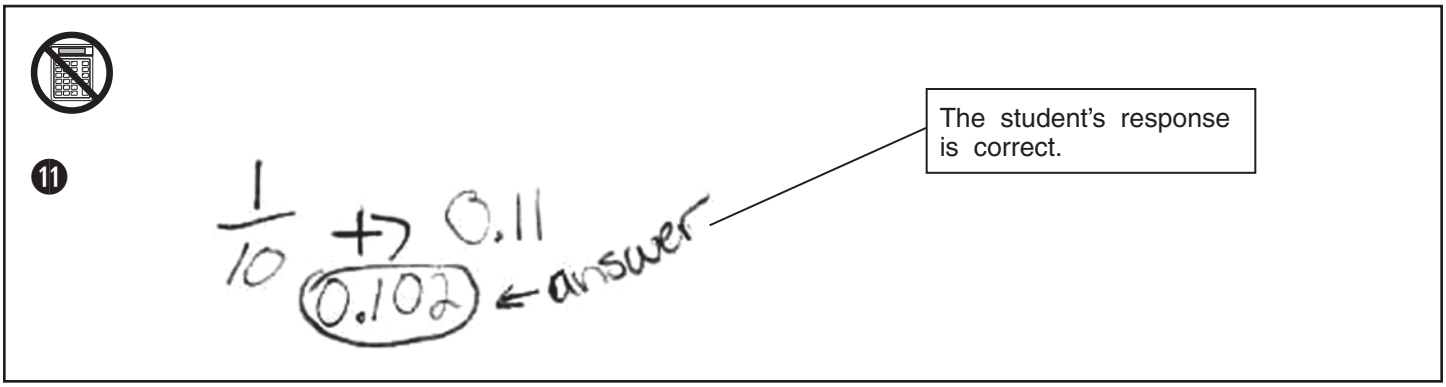
$$\frac{1}{100} < \frac{1}{10} < a < 0.11 < 1.1$$

What is a possible value of a?

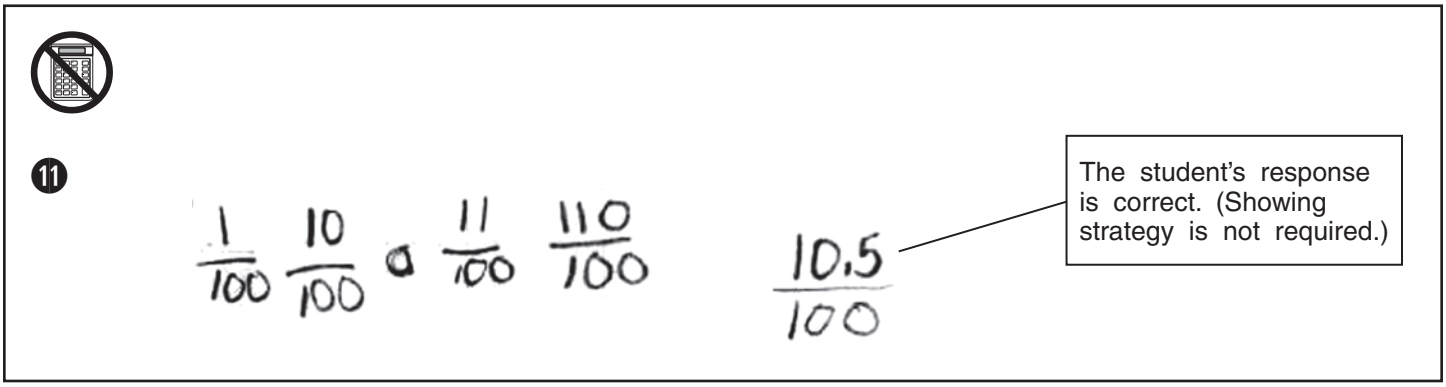
Scoring Guide

Score	Description
1	For correct answer, **any number between 0.1 and 0.11**, with no incorrect answers
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Score Point 1
(Example A)

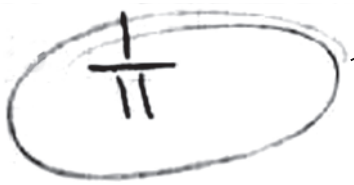


Score Point 1
(Example B)



Score Point 0
(Example A)

11



The student's response is incorrect.

Score Point 0
(Example B)

11

The student's response is incorrect.

DSP 6.5 **For a probability event in which the sample space may or may not contain equally likely outcomes, determines** the experimental or theoretical probability of an event in a problem-solving situation.

12 Angela has 5 fish. When she feeds them, she collects data about which fish eats first. Look at her data.

Which Fish Eats First?

Fish	Number of Times
Goldie	9
Marlin	5
Nemo	2
Dory	3
Flounder	6

Based on Angela's data, what is the probability that Nemo will eat first the next time Angela feeds the fish?

Scoring Guide

Score	Description
1	Correct answer, $\frac{2}{25}$ **or equivalent**
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Score Point 1
(Example A)

12 8 out of 100 or 2 out of 25

The student's response is correct.

Score Point 1
(Example B)

12 One in 12.5.

The student's response is correct.

SCORE POINT 0
(EXAMPLE A)

12 1 out of 5 chances

The student's response is incorrect.

SCORE POINT 0
(EXAMPLE B)

12 . It is very onlikly Demo will eat first.

The student's response is insufficient.

N&O 6.1 **Interprets a given representation** (circle graphs, line graphs, or stem-and-leaf plots) to answer questions related to the data, to analyze the data, to formulate or justify conclusions, to make predictions, or to solve problems. (IMPORTANT: Analyzes data consistent with concepts and skills in M(DSP)-6-2.)

13 This model shows the ratio of red paint to blue paint needed to make a shade of purple paint.

Key
R represents red paint
B represents blue paint

How many ounces of red paint are needed in order to make 30 ounces of purple paint? Show your work or explain how you know.

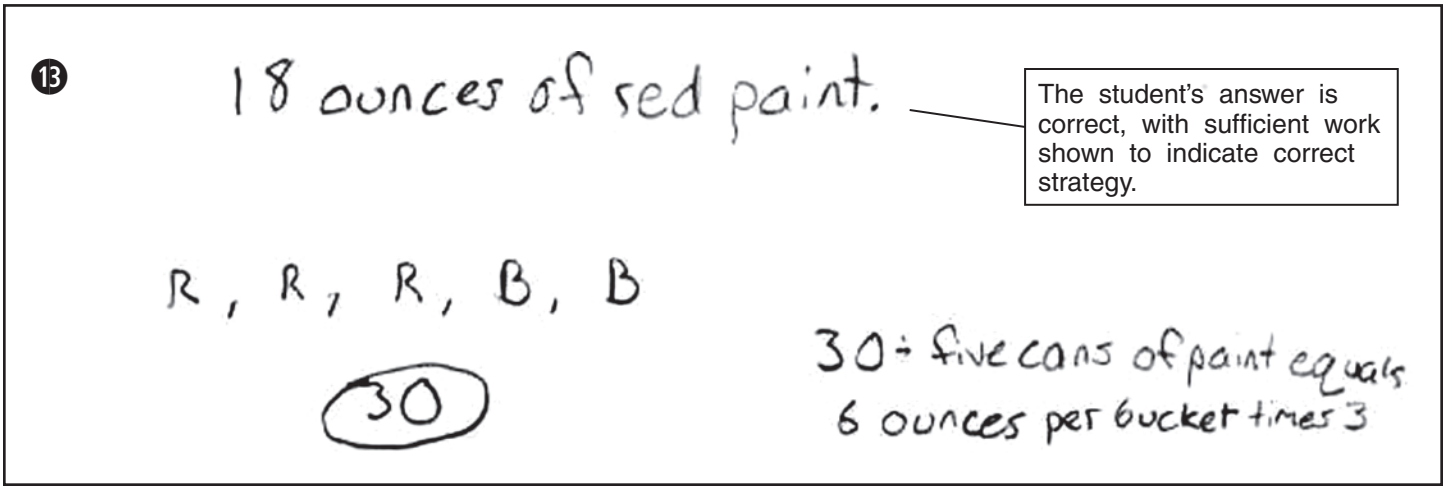
Scoring Guide

Score	Description
2	For correct answer, **18** (ounces), with sufficient work shown or explanation to indicate correct strategy
1	For correct answer with insufficient or no explanation or work shown OR appropriate strategy with incorrect or no answer
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

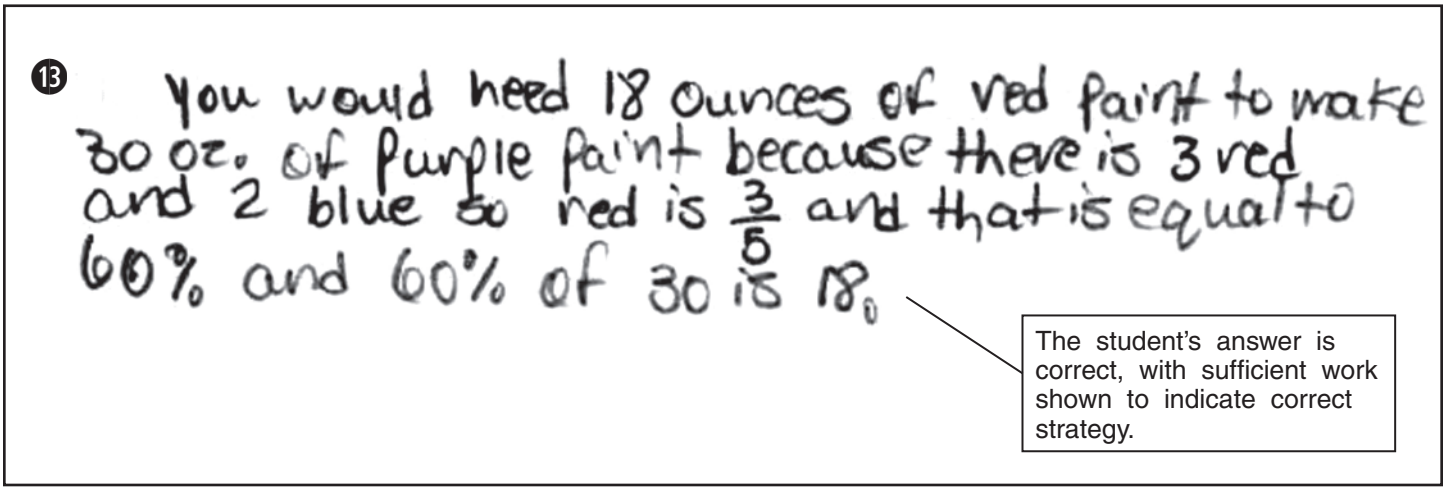
Sample Response:

The ratio is 3:2 so there are 5 parts
30 ÷ 5 = each part is 6 ounces
3 parts red × 6 oz = 18 ounces

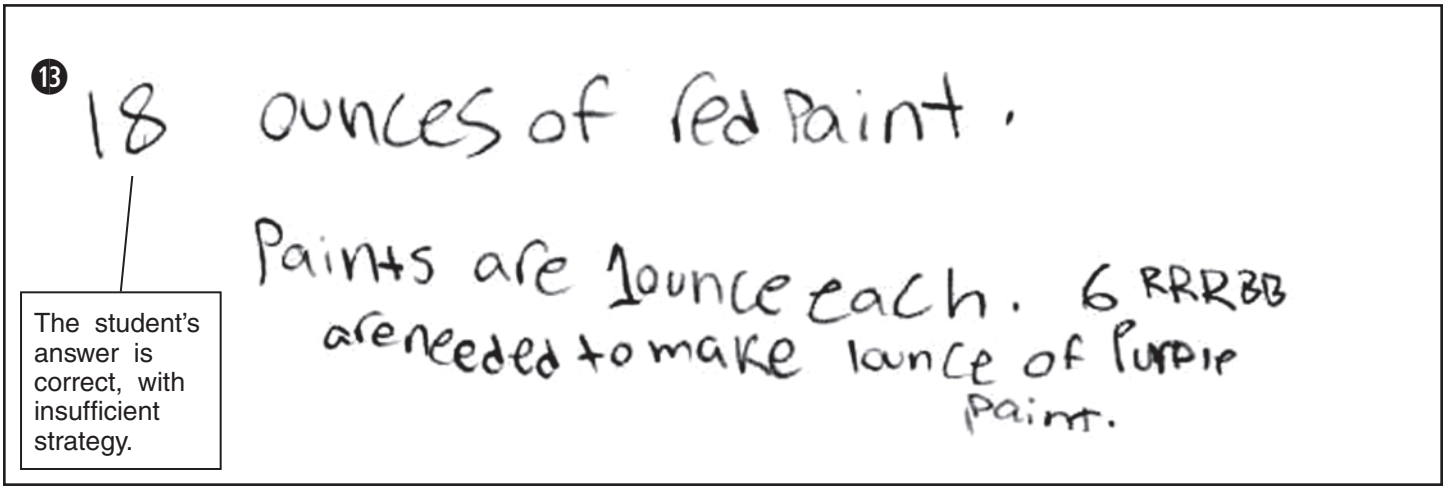
Score Point 2
(Example A)



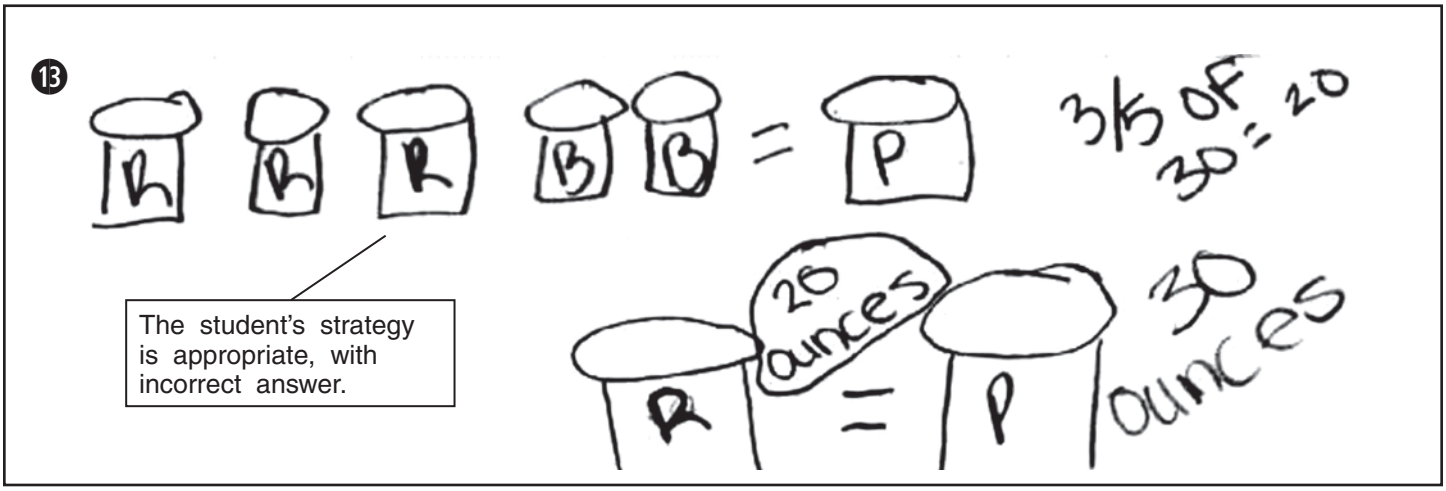
Score Point 2
(Example B)



Score Point 1
(Example A)



Score Point 1
(Example B)



SCORE POINT 0
(EXAMPLE A)

13

you would need 10 onces of red paint and 15 ounces of blue.

$3\overline{)30}\ 10$ $\quad 2\overline{)30}\ 15$

The student's strategy is incorrect.

SCORE POINT 0
(EXAMPLE B)

13

Ratio = 3/2

$30 \times 3 = 90$

$\frac{3}{2} = \frac{x}{30}$

$2\overline{)90}\ 45$

The student's strategy is incorrect.

F&A 6.3 **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write linear algebraic expressions involving two or more of the four operations; or by evaluating linear algebraic expressions (including those with more than one variable); or by evaluating an expression within an equation (e.g., determine the value of y when x=4 given y = 3x-2).

14 A construction company must pay a fine for completing a job late. The company uses the equation below to calculate the amount of the fine, f, in dollars, when the job is finished d days late.

$$f = 25{,}000 + 1{,}500d$$

The company completes a construction job 6 days late.

How much is the fine? Show your work or explain how you know.

Scoring Guide

Score	Description
2	for correct answer (\$)**34,000**, with sufficient work shown or explanation to indicate correct strategy
1	for correct answer with insufficient or no explanation or work shown OR appropriate strategy with incorrect or no answer
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Sample Response:

f = 25000 + 1500 × 6 = 25000 + 9000 = 34000. The fine is \$34,000.

Score Point 2
(Example A)

14

$f = 25,000 + 1,500d$
$f = 25,000 + 1,500 \times 6$
$f = 25,000 + 9,000$
$f = 34,000$

The fine is $34,000 because $1,500 \times 6 = 9000$ and $9000 + 25,000 = 34000$.

The student's answer is correct, with sufficient work shown to indicate correct strategy.

Score Point 2
(Example B)

14

$F = 25,000 + 1,500 d$

Fine - $34,000

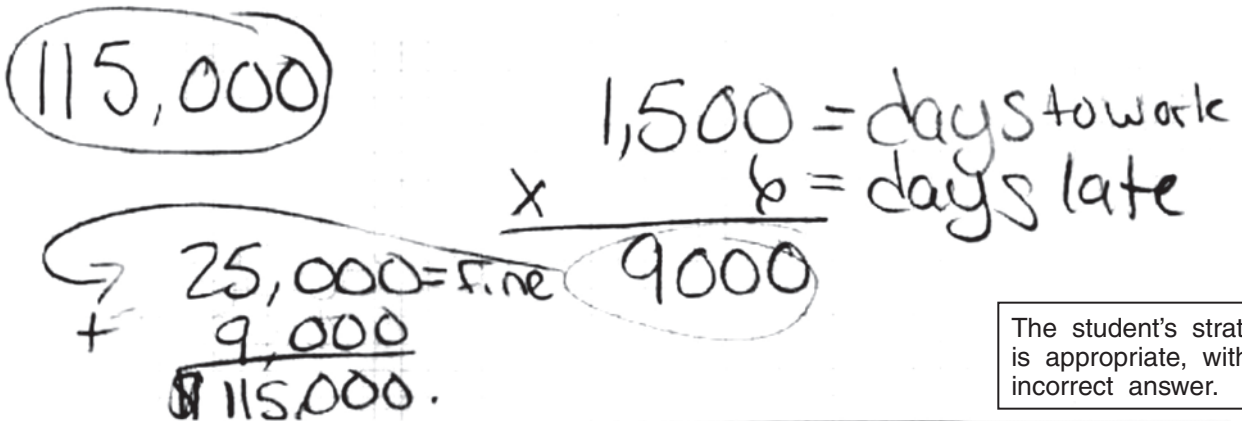
$$\begin{array}{r} 25,000 \\ +\ 9,000 \\ \hline 34,000 \end{array}$$

$$\begin{array}{r} 1,500 \\ \times\ \ \ 6 \\ \hline 9,000 \end{array}$$

The student's answer is correct, with sufficient work shown to indicate correct strategy.

Score Point 1
(Example A)

14



The student's strategy is appropriate, with incorrect answer.

Score Point 0
(Example A)

14

I think it is 26,500. I added up 25,000 and 1,500. Thats how I got my answer.

The student's strategy is incorrect.

SCORE POINT 0
(EXAMPLE B)

14

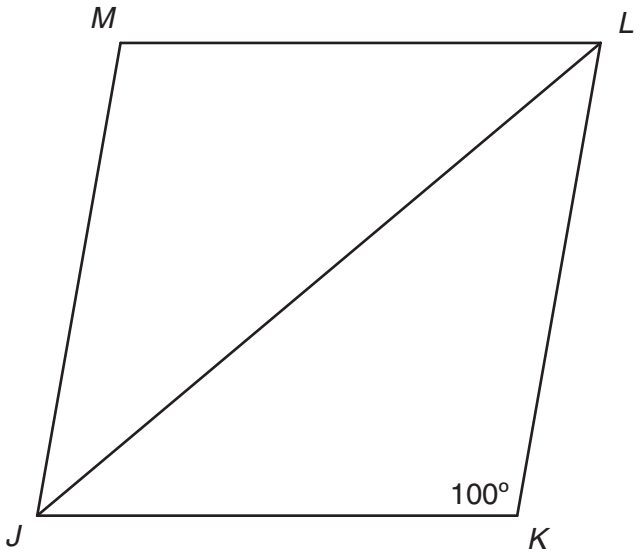
The student's strategy is incorrect.

G&M 6.1 **Uses properties or attributes of angles** (right, acute, or obtuse) **or sides** (number of congruent sides, parallelism, or perpendicularity) **to identify, describe, classify, or distinguish** among different types of triangles (right, acute, obtuse, equiangular, scalene, isosceles, or equilateral) or quadrilaterals (rectangles, squares, rhombi, trapezoids, or parallelograms).

15 Look at List A and List B.

List A	List B
acute	equilateral
obtuse	isosceles
right	scalene

a. *JKLM* is a rhombus.



Describe triangle *JKL* using one word from List A and one word from List B. Explain why each word you use describes the triangle.

Rectangle *PQRS* is not shown. Rectangle *PQRS* is not a square.

b. Describe triangle *PSQ* using one word from List A and one word from List B. Explain why each word you use describes the triangle.

Scoring Guide

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point OR Shows minimal understanding of classifying triangles (e.g., 2 correct descriptors with no contradictory descriptors).
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response

Training Notes

Part a:	2 points	for correct description, **isosceles and obtuse**, with sufficient explanation and no incorrect descriptors given
		OR
	1 point	for one correct descriptor with sufficient explanation, provided second descriptor is not logically inconsistent with correct descriptor or for both correct descriptors, with insufficient or no explanation given
Part b:	2 points	for correct description, **scalene and right**, with sufficient explanation and no incorrect descriptors given
		OR
	1 point	for one correct descriptor with sufficient explanation, provided second descriptor is not logically inconsistent with correct descriptor or for both correct descriptors, with sufficient or no explanation given

Notes: Penalize 1 point total for usage of unacceptable terms (“even”, “corner”, etc.).

SCORE POINT 4
(EXAMPLE A)

15

a) The student's response is correct, with sufficient explanation.

A.) TRIANGLE JKL

* List A word: obtuse
This word describes the triangle because one of the angles in the triangle is more than 90° (obtuse) and the other two are less than 90° (acute)

* List B word: Isosceles
This word describes the triangle because two of the sides are equal and one is longer. That is what describes an isosceles triangle.

b) The student's response is correct, with sufficient explanation.

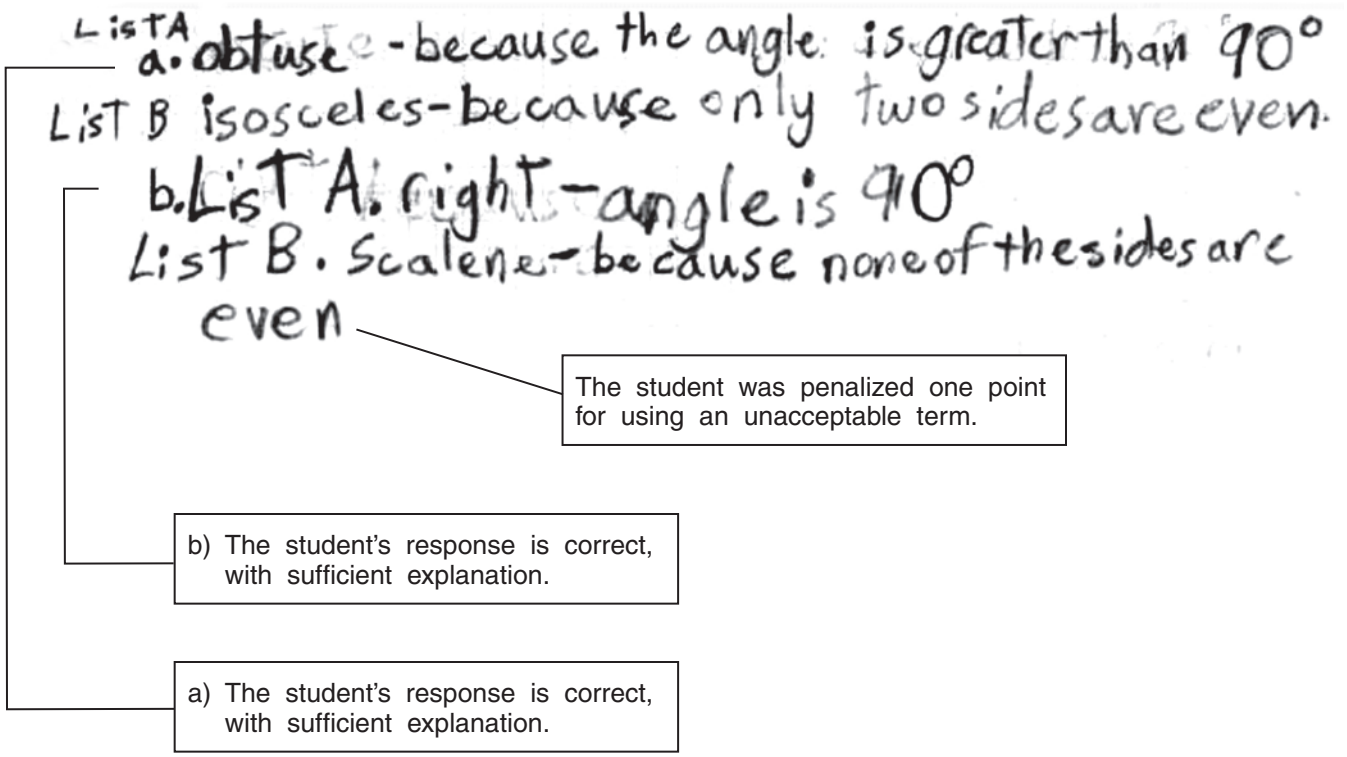
B) Triangle PSQ

* List A word: right
This word describes the triangle because if it is part of the rectangle it has to have a right angle.

* List B word: scalene
This word describes the triangle because all of the side lengths on the triangle are different.

SCORE POINT 3
(EXAMPLE A)

15



The student was penalized one point for using an unacceptable term.

b) The student's response is correct, with sufficient explanation.

a) The student's response is correct, with sufficient explanation.

SCORE POINT 2
(EXAMPLE A)

15

a. obtuse and scalene

JKL has an obtuse angle and it's scalene because no angles are the same.

b. right and isoscele

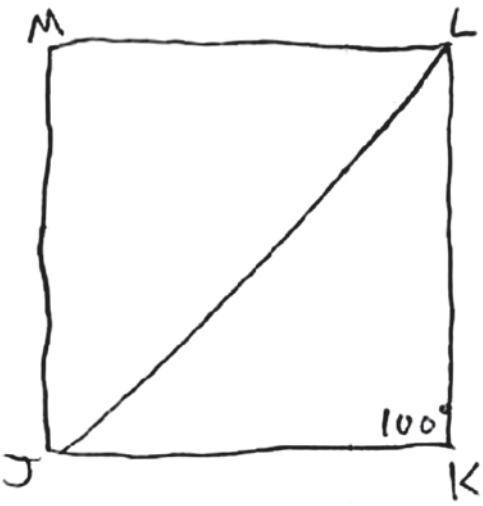
There would have to be a right angle and it have to be isosceles because it has 2 of the same angles.

b) The student's descriptor, right, is correct, with sufficient explanation. The incorrect descriptor, isosceles, is not logically inconsistent.

a) The student's descriptor, obtuse, is correct, with sufficient explanation. The incorrect descriptor, scalene, is not logically inconsistent.

SCORE POINT 2
(EXAMPLE B)

15



JKL = Obtuse, isosceles

a) The student's descriptors are correct, with no explanation.

PQRS = Right, scalene

b) The student's descriptors are correct, with no explanation.

SCORE POINT 1
(EXAMPLE A)

15

a obtuse + scalene I chose because it is obtuse and scalene.

b right + scalene because it is right and scalene.

a) The student's descriptor, obtuse, is correct, with no explanation. The student's descriptor, scalene, is incorrect. (No credit is given for only one correct descriptor without explanation.)

b) The student's descriptors are correct, with no explanation.

SCORE POINT 0
(EXAMPLE A)

15

a. I think it Is a Obtuse and a Scalene triagle

b. I would say it is Probly a acute and a isosceles triagle

a) The student's descriptor, obtuse, is correct, with no explanation. The student's descriptor, scalene, is incorrect. (No credit is given for only one correct descriptor without explanation.)

b) The student's descriptors are incorrect.

Grade 7 Mathematics Released Item Information

Released Item Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No Tools Allowed		✓	✓					✓	✓		✓				
Content Strand[1]	NO	NO	NO	GM	GM	FA	FA	FA	FA	DP	NO	DP	NO	FA	GM
GLE Code	6-1	6-3	6-4	6-5	6-6	6-1	6-2	6-3	6-4	6-1	6-2	6-5	6-1	6-3	6-1
Depth of Knowledge Code	2	1	1	2	2	2	2	2	2	2	2	1	2	1	2
Item Type[2]	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC	SA	SA	SA	SA	CR
Answer Key	A	A	D	A	A	B	C	B	D	B					
Total Possible Points	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4

[1]Content Strand: NO = Numbers & Operations, GM = Geometry & Measurement, FA = Functions & Algebra, DP = Data, Statistics, & Probability

[2]Item Type: MC = Multiple Choice, SA = Short Answer, CR = Constructed Response